The value of x is 35.

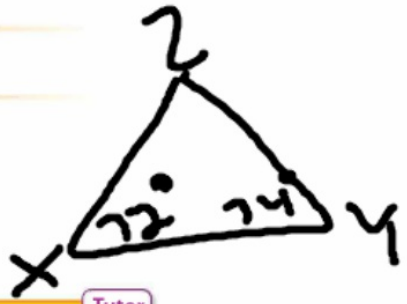
Show your work.

Got It? Do this problem to find out.

a. In $\triangle XYZ$, if $m\angle X = 72°$ and $m\angle Y = 74°$, what is $m\angle Z$?

34°

180 − 72 − 74
180 − 146



Segments

$\overline{AB}$ is read as segment AB. So the sides of the triangle below are $\overline{AB}$, $\overline{AC}$, and $\overline{BC}$.

Example

Tutor

2. **The measures of the angles of $\triangle ABC$ are in the ratio 1:4:5. What are the measures of the angles?**

1x 4x 5x

Let x represent the measure of angle A.

Then $4x$ and $5x$ represent angle B *and* angle C.

Got It? Do this problem to find out.

$x = \frac{180}{12} = 15$

Show your work.

15 × 6
15 × 4
15 × 2

b. The measures of the angles of $\triangle LMN$ are in the ratio 2:4:6. What are the measures of the angles?

$x = 15$

b. 30°, 60°, 90°

$2x + 4x + 6x = 180$
$12x = 180$

$m\angle C + m\angle 1 = 180$

$\angle A + \angle B + \angle C = \angle C + \angle 1$

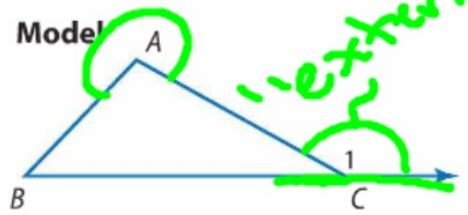
$\angle A + \angle B + \angle C = 180$

Exterior Angles of a Triangle

Key Concept

Words The measure of an exterior angle of a triangle is equal to the sum of the measures of its two remote interior angles.

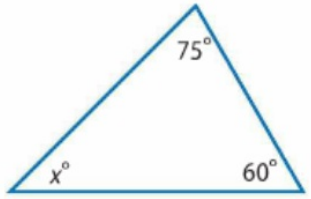
Model



Symbols $m\angle A + m\angle B = m\angle 1$

1. Find the value of x in the triangle. (Example 1)

45



2. What is the value of x in the sail of the sailboat at the right? (Example 1) **90**

$x = 22.5$

$1x + 2x + 5x = 180$

3. The measures of the angles of $\triangle LMN$ are in the ratio 1:2:5. What are the measures of the angles? (Example 2)

22.5°, 45°, 112.5°

$\frac{8x}{8} = \frac{180}{8}$

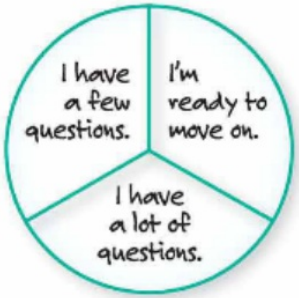
4. Find the value of x in the triangle. (Example 3) **31**

5. **Building on the Essential Question** How can you find the missing measure of an angle in a triangle if you know the measure of two of the interior angles?

Sample answer: If you know the measure of two of the interior angles, you can subtract the sum of those angles' measures from 180 to find the missing measure.

Rate Yourself!

Are you ready to move on? Shade the section that applies.

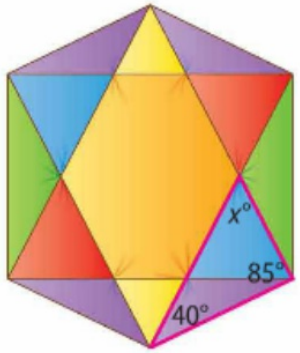


For more help, go online to access a Personal Tutor.

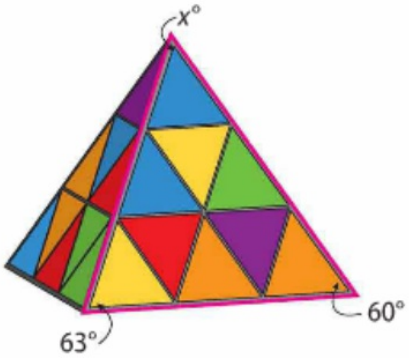
Tutor

Jan Cook/Botanica/Getty Images Copyright © McGraw-Hill Education

1. The top of a kite is shown below. What is the value of x? (Example 1) **55**



2. A popular toy puzzle is shown below. What is the value of x? (Example 1) **57**



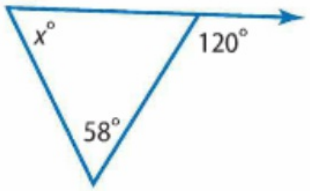
3. The measures of the angles of $\triangle RST$ are in the ratio 2:4:9. What are the measures of the angles? (Example 2) **24°, 48°, 108°**

4. The measures of the angles of $\triangle XYZ$ are in the ratio 3:3:6. What are the measures of the angles? (Example 2) **45°, 45°, 90°**

Find the value of x in each triangle. (Example 3)

5. 112

6. 62



7. 45

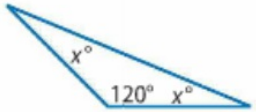
8. In $\triangle ABC$ the measure of angle A is $2x + 3$, the measure of angle B is $4x + 2$, and the measure of angle C is $2x - 1$. What are the measures of the angles? $m\angle A = 47°, m\angle B = 90°, m\angle C = 43°$

9 CCSS **Reason Abstractly** What is the measure of the third angle of a triangle if one angle measures 25° and the second angle measures 50°?

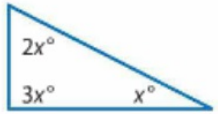
105°

Find the measures of the angles in each triangle.

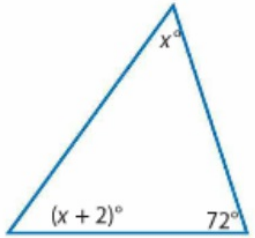
10. **120°, 30°, 30°**



11. **90°, 60°, 30°**

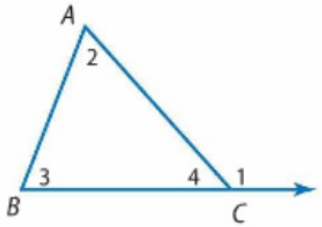


12. **53°, 55°, 72°**



H.O.T. Problems Higher Order Thinking

13. **Persevere with Problems** Use the figure at the right to informally prove that an exterior angle of a triangle is equal to the sum of its two remote interior angles.

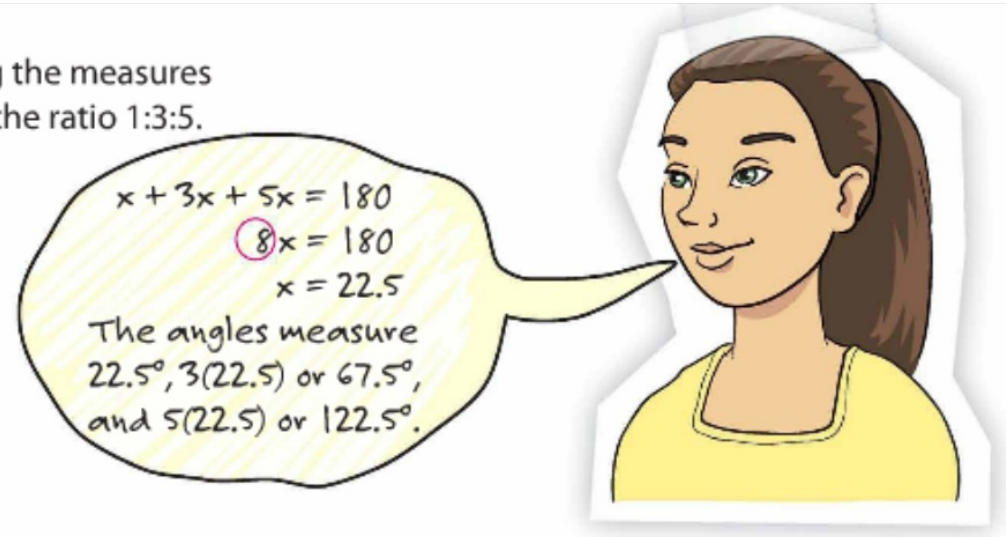


Given: $\triangle ABC$; $\angle 1$ is an exterior angle.

Prove: $m\angle 1 = m\angle 2 + m\angle 3$

Proof: **Sample answer: Since $\angle 1$ and $\angle 4$ form a straight angle, $m\angle 1 + m\angle 4 = 180°$. By the Subtraction Property of Equality, $m\angle 1 = 180 - m\angle 4$. Since ABC is a triangle, $m\angle 2 + m\angle 3 + m\angle 4 = 180$. By the Subtraction Property of Equality, $m\angle 2 + m\angle 3 = 180 - m\angle 4$. So by substitution, $m\angle 2 + m\angle 3 = m\angle 1$.**

14. **Find the Error** Alma is finding the measures of the angles in a triangle that have the ratio 1:3:5. Circle her mistake and correct it.



9x = 180

x = 20

The angles measure 20°, 60°, and 100°.

15. **Justify Conclusions** Make a conjecture about the sum of the interior angles of a quadrilateral. Justify your reasoning.

Sample answer: The sum is 360°. Drawing the diagonal of a quadrilateral forms two triangles. So, the sum of the interior angles is 2(180°), or 360°.